

## PATENT ABSTRACTS OF JAPAN

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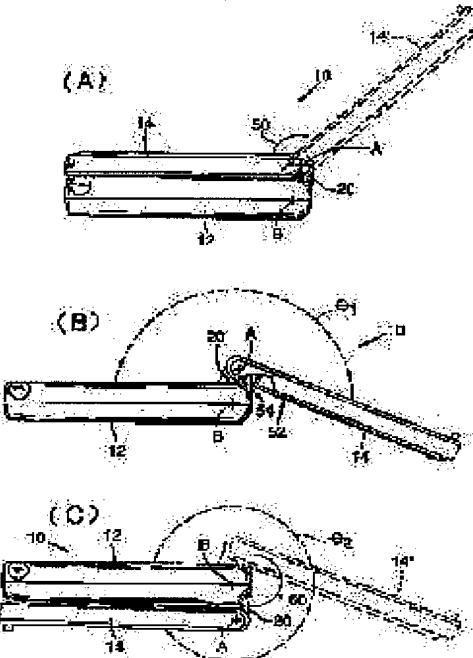
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**(54) HINGE DEVICE**

**(57)Abstract:**

**PROBLEM TO BE SOLVED:** To open the cover of a device such as electronic pocketbook by almost 360 degrees and handle it easily.

**SOLUTION:** Two links (axes A and B) are provided to connect a main body 12 with a cover 14. A first hinge having the axis A operates up to an opening angle of  $\alpha$  from the closing state of the cover. The opening limit of the first hinge is  $\alpha_1$ . When a force is further applied thereto to open the cover, a second hinge (axis B) having a required torque larger than the first hinge operates, allowing the cover to be opened up to 360 degrees.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1]In a hinge device used for making it circle in the 1st structure to the 2nd structure, It can operate so that the 1st structure may be combined with the 2nd structure in operation and it may be made to circle in the 1st structure over the range of the 1st movement to the 2nd structure under the 1st torque, The 1st hinge with which the operation will be blocked by restraining force if said 1st range is exceeded, Although said 1st structure is combined with said 2nd structure in operation and it is larger than said 1st torque, if the 2nd torque insufficient for overcoming said restraining force is added, A hinge device containing the 2nd hinge that can operate so that said 1st structure can circle over the range of the 2nd movement to said 2nd structure.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application]Generally this invention relates to the 1st hinge that operates more particularly so that it may be made to circle in a cover panel selectively to the bottom panels in a bivalve-like device, the 2nd hinge, and the hinge device which it has about a hinge device. Although a use is large, the context called a hand held computer notebook (handheld computer organizer), i.e., the device in which the specific use was shown, explains this invention about this invention below.

**[0002]**

[Description of the Prior Art] In recent years, the request to a computer notebook and more particularly the requests to the hand held computer notebook which has the feature also similar to paper and a pen also in a desktop computer are mounting. Generally, these computer notebooks contain a keyboard and a display screen. The display screen is constituted so that a user may receive the input from the pen-like stylus which can draw a picture on a display screen by it. Such a computer notebook is realized in many cases in the forms of bottom panels, the cover panel which circles to bottom panels, and the included device, in order to open the shape of a bivalve, i.e., a device, or to close. Generally, bottom panels demarcate a keyboard. Generally, a cover panel demarcates a display screen. Therefore, one computer notebook also as a desktop computer (both a keyboard and a display screen are used), Or it can be made to operate also as Note Pad (only a display screen is used) which can draw a picture on it using a stylus.

[0003] Therefore, a hand held computer notebook, In order for the "side position" where a user can access both a display screen and a keyboard, or a cover panel to expose only a display screen, it is optimal to be constituted so that it can be used even in the "longitudinal position" turned up to bottom panels. Similarly, bottom panels and a cover panel provide the device of the shape of a bivalve foldable for opposite which can be opened thoroughly or can be closed. In this, a cover panel needs to circle over 360-degree movement to bottom panels. This work becomes difficult with the thickness of bottom panels and a cover panel in many cases. So far, such revolution was attained using the complicated linkage device which needs much user's operation. Generally, the hinge was used with these devices. Such a hinge is stored in the slot which needs to adjust a hinge position in many cases, in order to attain movement of the total range of a cover panel. In other devices, the linkage device with which a cover panel is linked to bottom panels by the multiaxial hinge array was used. However, with such a device, too complicated hinge operation was required, and in order that these hinges might operate independently mutually, opening and closing of the device were difficult.

**[0004]**

[Problem(s) to be Solved by the Invention] The linkage device which can control opening and closing of a bivalve-like device without needing complicated user's operation is required. Therefore, it is desirable to provide the 1st hinge with which the delivery by which the turning operation to other hinges [ hinge / a certain ] was controlled is attained, the 2nd hinge, and the hinge device which it has. It is desirable

to still more specifically provide the multiaxial hinge device for which revolution of at least one hinge in such a hinge has the 1st regulated automatically and the hinge which the 2nd estranged mutually at any time.

[0005]

[Means for Solving the Problem] In this invention, an above-mentioned problem is coped with by providing a hinge device which has the 1st hinge that can operate if torque different, respectively is added, and the 2nd hinge. If the 1st torque is added, the 1st hinge will operate so that it may be made to circle in this structure over the range of the 1st movement. If the 1st range is exceeded, the 1st hinge will be blocked by comparatively large restraining force. It will operate, if the 2nd torque insufficient for overcoming this restraining force is added, although the 2nd hinge is larger than the 1st torque. If the 2nd torque is added, it can circle in this structure over the range of the 2nd movement. Generally, movement of the 2nd range takes place after movement of the 1st range. Therefore, the hinge operates in collaboration so that revolution is possible and the bivalve-like the 1st panel and 2nd panel (or structure) of a device may be combined.

[0006] A hinge is attached on a middle linkage element which demarcates a fixed pivot estranged mutually [ it is desirable and / a couple ]. The 1st hinge combines the 1st panel with a linkage element so that revolution is possible, the 1st hinge shaft is demarcated, and the 2nd hinge combines the 2nd structure with a linkage element so that revolution is possible, and it demarcates the 2nd hinge shaft. Since torque required to operate a hinge differs, he can understand that set working [ the 1st hinge ], and it is fixed, set the 2nd hinge working [ the 2nd hinge ], and the 1st hinge is fixed. Therefore, a linkage element is set working [ the 1st hinge ], it is fixed to the 2nd panel, and it is set working [ the 2nd hinge ], and is fixed to the 1st panel. Thereby, revolution covering 360-degree rotation is controllable without the necessity of adjusting a linkage element manually, on parenchyma over the 2nd panel of the 1st panel.

[0007] If a drawing and the following detailed explanation are considered, you can understand more easily the purpose and an advantage of these of this invention, and an addition.

[0008]

[Example] 10 shows the bottom panels 12, the cover panel 14, and the hand held computer notebook it has to drawing 1. As shown in a figure, the bottom panels 12 demarcate the keyboard 12a which comprised a field according to the computer keyboard of the standard of a well-known type for the time being. Bottom panels

demarcate the cavity 12b constituted so that the stylus 16 which generally takes the form of a pen might be received. The cover panel 14 should care about demarcating the display screen 14a constituted so that the input from the stylus of the shape of a pen to which a user can draw a picture on a display screen by it might be received. [0009]In various composition which can input data or can be searched using a keyboard, a display screen, or its both, the computer notebook 10 is useful. Therefore, a computer notebook is realized in the form of a device where a cover panel and bottom panels circle mutually, in order to open the form of a bivalve-like device, i.e., a device, or to close. For example, (A) of drawing 2 thru/or (C) show the revolution to the angle ((C) of drawing 2) thoroughly opened from the angle ((A) of drawing 2) which the cover panel closed thoroughly. Various interim angles are shown by the dotted line. This is attained by the hinge device 18 which combines bottom panels and a cover panel by the method explained below so that revolution is possible.

[0010]As shown in drawing 1, the hinge device 18 includes the linkage element 20 which combines bottom panels and a cover panel via the hinge of a couple, in order to enable opening and closing of a device. The 1st hinge 30 combines a linkage element with a cover panel so that revolution is possible, and it demarcates 1st hinge shaft A. The 2nd hinge 40 combines a linkage element with bottom panels so that revolution is possible, and it demarcates 2nd hinge shaft B. It is separated from two hinge shafts of each other so that the revolution covering 360-degree rotation may be suited on the parenchyma over the bottom panels of a cover panel.

[0011]If (A) of drawing 2 thru/or (C) are referred to, the cover panel 14 will circle to the bottom panels 12 using both the 1st hinge and the 2nd hinge, but. He can understand that the 1st hinge operates only during movement of the 1st range of a cover panel, and the 2nd hinge operates only during movement of the 2nd range of a cover panel. If a device is opened, movement of the 2nd range will take place immediately after movement of the 1st range. This means that a motion of at least one hinge in the 1st hinge and the 2nd hinge is regulated at which time. Therefore, only one side of the 1st hinge and the 2nd hinge operates at once. Of course, being generally used, since both a single hinge and a series of hinges which demarcate a single hinge shaft are expressed with this application can understand the term of the 1st hinge and 2nd hinge to a person skilled in the art.

[0012]It is made to circle in the cover panel 14 around the 1st axis A via the 1st hinge 30 first, while the linkage element 20 had been fixed to the bottom panels 12, in order to have opened the device. When a user wants to use a computer notebook as a desktop computer, it is made to circle in a cover panel to the "side position angle"

shown in 14'. When a user wants to use a computer notebook as Note Pad, revolution is continued over the total range of the 1st movement so that it may be shown by the arrow 50. If a predetermined half-open angle is reached ((B) of drawing 2), the cover panel 14 will block that engage with the linkage element 20 and a cover panel circles more around the 1st axis A. According to the embodiment of a graphic display, the cover panel outside surface 52 engages with the linkage element outside surface 54. The field 54 is committed as a hard stop. Thereby, the limit over the range of movement of the 1st of a cover panel is effectually demarcated by the angle of traverse theta 1. The limit of another side is demarcated by zero angle of traverse, when the device has closed thoroughly. Then, both (it is shown by the arrow 60 of (C) of drawing 2 like) a linkage element and a cover panel circle around the 2nd axis B. A cover panel circles in a cover panel and a linkage element over the total range of the 2nd movement to the "side position angle" turned up to bottom panels. One limit of the range of the 2nd movement is equivalent to the limit of the range of the 1st movement, as shown in 14" of drawing 2 (C). As the limit of another side is shown in (C) of drawing 2, a cover panel is the angle which engages with bottom panels and which was opened thoroughly. Therefore, he can understand that a cover panel circles to the angle theta 2 to bottom panels. theta 2 expresses the revolution covering 360-degree rotation on parenchyma here. Therefore, a device can be turned and a display screen can be used as Note Pad.

[0013]Therefore, when closing a device from the angle which (C) of drawing 2 opened thoroughly, it is made to circle in the cover panel 14 around the 2nd axis B over the range of the 2nd movement identified before with a linkage element first. If a half-open angle is reached, it will prevent a linkage element's being automatically locked by the proper place and it circling more. However, a cover panel circles in the surroundings of the 1st axis A succeedingly over the range of the 1st movement identified before until it reaches the angle which is shown in (A) of drawing 2 and which was closed thoroughly. Therefore, the 1st hinge 30 can understand that it can operate while the cover panel is circling within the limits of the 1st movement, and the 2nd hinge 40 can operate while the cover panel is circling within the limits of the 2nd movement. This is attained by using two or more hinges which are called the 1st hinge that can operate when the 1st torque T1 is received, and the 2nd hinge that can operate when the 2nd larger torque T2 than the 1st torque T1 is received and which have a different torque characteristic.

[0014]About operation of a hinge device, drawing 3 in which decomposition isometric drawing of the hinge device 18 is shown, and the assembled hinge device are more

nearly thoroughly explained with reference to drawing 4 shown in detail. As shown in a figure, the linkage element 20 has 2 piece composition. Such a piece captures the 1st hinge 30 and 2nd hinge 40 unitedly, and demarcates the collaboration hinge device which can attain smooth opening and closing of a computer notebook by it. A linkage element contains the piece 20a of a back part and the piece 20b of the front part which were specially constituted so that it might combine with another side, respectively. For example, the piece 20 of a back part includes the upper part socket part 22a and the bottom socket part 24a which combine with the upper part socket part 22b of the piece of the front part, and the bottom socket part 24b, and provide an upper hinge socket and a bottom hinge socket. The 1st hinge 30 sits down to an upper hinge socket, and the 2nd hinge 40 sits down to a bottom hinge socket.

[0015]Each hinge socket is constituted so that it can circle in the surroundings of the hinge shaft to which the hinge corresponds, but the locking mechanism by which the turning operation of the 2nd hinge is blocked by it also demarcates a bottom hinge socket again. Therefore, he can understand that the bottom socket part 24a demarcates the 1st notch that has the floor 26a, and the bottom socket part 24b demarcates the 2nd notch that has the floor 26b. The 1st notch has the side attachment walls 25a and 27a which counter. Similarly, the 2nd notch has the side attachment walls 25b and 27b which counter. Generally, the side attachment walls 27a and 27b are vertical to each notch floor. The side attachment walls 25a and 25b make an obtuse angle to each notch floor so that cam type engagement can be carried out with the cam type locking tab which corresponds to below so that it may explain.

[0016]Next, when the 1st hinge 30 is referred to, it turns out that such a hinge contains the shaft 32 attached in the housing 34. The housing 34 contains friction bushing (not shown) which blocks revolution of the shaft 32 by fixed frictional force substantially. Therefore, the shaft 32 can rotate within the housing 34, only when the 1st corresponding torque T1 that overcomes disturbance of friction bushing is received. Generally, the shaft 32 rotates under the 1st torque T1 of an about 11.2-16.0-N millimeter.

[0017]The shaft 32 contains the tab 32a constituted so that it might be received in the slot 14b of the cover panel 14 (drawing 4) which fixes the shaft 32 effectually to the cover panel 12. The housing 34 contains the tab 34a constituted so that it might be received within the slot 23 to which the piece 20a of a linkage element back part corresponds. Thereby, the housing 34 is effectually fixed to the linkage element 20. If the torque T1 is added, the 1st hinge 30 will operate so that it may be made to circle in a cover panel over the range of the 1st movement to a linkage element. However,

on nominal value, a linkage element is fixed to bottom panels until it adds the 2nd (larger than 1st torque T1) torque T2 that can release the locking mechanism of the 2nd hinge 40. Therefore, a cover panel circles to bottom panels on nominal value over the range of the 1st movement by which both ends were demarcated with the angle ((A) of drawing 2) and half-open angle ((B) of drawing 2) which were closed thoroughly. Generally, while being within the limits of the 1st movement, the torque T2 is not impressed when revolution can be attained under the 1st torque T1.

[0018]Next, when the 2nd hinge 40 is referred to, it turns out that the 2nd hinge contains the pintle 42 which has the tab 42b which sits down in the slot 12c of the cover panel 12 (drawing 4). Thereby, a pintle is effectually fixed to bottom panels. The pintle 42 sits down in the socket demarcated by the bottom socket parts 24a and 24b again. However, when the 2nd torque T2 is added, such seating is locked so that release is possible, so that a linkage element can circle to bottom panels. A pintle is attached in a socket via the annular rib (the part is shown by 28a) of a linkage element. Such a rib is constituted so that it may enter exactly in the annular channel 48 to which the pintle 42 corresponds. The helical spring 44 is prolonged along with a pintle between the floating washers 44b related to the fixed washer 44a. The washer 44b demarcates one wall of the annular channel 48. The wall of another side is demarcated by the boundary of the pintle 42. Therefore, the channel can change, when the bias of the helical spring 44 is overcome (that is, it becomes large).

[0019]The pintle 42 contains the head 43 to which the cam type locking tabs 46a and 46b of a couple which stick and fit in again in the notch to which the linkage element 20 corresponds extend from there. The locking tabs 46a and 46b are shown in (A) in drawing 3 in which the 2nd hinge is shown from a different viewpoint, and (B) in detail. The side attachment walls 45a and 45b which make an obtuse angle to a field including the floor of the locking tab which corresponds so that cam type engagement can be carried out with the side attachment walls 47a and 47b vertical to the field which includes the floor of the locking tab with which each locking tab generally corresponds so that it may be shown in a figure, and a corresponding notch side attachment wall are demarcated.

[0020]In the nominal angle, the pintle 42 is locked to a linkage element. Bias of the pintle is carried out toward the locked position where the locking tabs 46a and 46b fit in in the notch to which the bottom socket of a linkage element corresponds (helical spring 44). However, please care about that spring bias can be overcome by what the 2nd torque T2 is added to a pintle for for the cam type relation between a locking tab and a notch (shown to (C) of drawing 2 by the arrow 60). Generally, the 2nd torque T2

is twice [ at least ] the 1st torque T1, and is preferred. [ of a 30–32 N millimeter ] By this 2nd torque, a locking tab separates by a cam operation from a notch, a locking tab runs aground on the cam type side attachment walls 25a and 25b, and it comes out in up to the outside surface of a bottom socket. Therefore, the pintle 42 is movable to a transverse direction, as shown to drawing 4 in 70. Then, a locking tab rides and moves to an outside surface, and the main disturbance over such rotation is produced according to the frictional force between a locking tab and an outside surface. In this case, a pintle rotates under torque T3 smaller than T1 smaller than T2 and.

[0021]Therefore, if the 1st torque is added to a cover panel, the 1st hinge will operate so that it may be made to circle over movement of the 1st range. If the 1st range is exceeded, the 1st hinge will be blocked by comparatively large restraining force. It will operate, if the 2nd torque insufficient for overcoming this restraining force is added similarly, although the 2nd hinge is larger than the 1st torque. If the 2nd torque is added, a cover panel will circle over the range of the 2nd movement. Movement of the 2nd range usually takes place after movement of the 1st range.

[0022]Since torque required to operate these hinges differs mutually, as for the 2nd hinge, the 1st hinge is fixed working, and the 1st hinge can understand the thing of the 2nd hinge fixed working. Therefore, during operation of the 1st hinge, it is fixed to bottom panels, and a linkage element is fixed to a cover panel during operation of the 2nd hinge. Thereby, the revolution covering 360-degree rotation can be controlled on the parenchyma over the 2nd panel of the 1st panel, without needing the hand regulation of a linkage element.

[0023]Therefore, in the hinge device of this invention, it turns out that opening and closing of bivalve-like devices, such as a hand held computer notebook, are improved substantially. Torque required for what is necessary's being just to make it circle in a cover panel to bottom panels, and making it circle in a hinge in rotation of these phases, in order to open a device is chosen so that hinge operation may win popularity to other hinges automatically and may be passed to them from the hinge according to a predetermined standard. If the 1st hinge operates within the limits of movement of the 1st of a cover panel under the torque T1 and the 1st range is exceeded, it will encounter the disturbance power of the form of a hard stop. Then, the 2nd hinge will operate, if the 2nd torque T2 is added. After a locking mechanism separates, the 2nd hinge operates under 3rd torque T3 over the range of the 2nd movement.

[0024]As mentioned above, although graphic display explanation was given referring to an above-mentioned principle of operation and desirable embodiment for this invention, probably, it will be clear to a person skilled in the art that other gestalten

and a detailed change can be added to this invention, without deviating from the pneuma and the range of this invention. For example, although the hinge device is mentioned above in the context of the hand held computer notebook, this invention is not limited such and the hinge device of a claim can understand that it is a thing explaining the use of devices arbitrary as a matter of fact which makes it circle in the 1st structure to the 2nd structure.

[0025]Below, the examples of the mode of operation of this invention are enumerated.

[0026][Embodiment 1] In the hinge device used for making it circle in the 1st structure to the 2nd structure, It can operate so that the 1st structure may be combined with the 2nd structure in operation and it may be made to circle in the 1st structure over the range of the 1st movement to the 2nd structure under the 1st torque, The 1st hinge with which the operation will be blocked by restraining force if said 1st range is exceeded, Although said 1st structure is combined with said 2nd structure in operation and it is larger than said 1st torque, if the 2nd torque insufficient for overcoming said restraining force is added, A hinge device containing the 2nd hinge that can operate so that said 1st structure can circle over the range of the 2nd movement to said 2nd structure.

[0027][Embodiment 2] A hinge device given in the embodiment 1, wherein said 2nd hinge is fixed working [ said 1st hinge ] so that revolution is possible and said 1st hinge is fixed working [ said 2nd hinge ] so that revolution is possible.

[0028][Embodiment 3] The linkage element combined with said 1st hinge and said 2nd hinge is included, A hinge device given in the embodiment 2 said 1st hinge's combining said 1st structure with said linkage element so that revolution is possible, demarcating the 1st hinge shaft and said 2nd hinge's combining the 2nd structure with said linkage element so that revolution is possible, and demarcating the 2nd hinge shaft.

[0029][Embodiment 4] A hinge device given in the embodiment 3, wherein it is fixed to said 2nd structure during revolution of said 1st hinge and said linkage element is fixed to said 1st structure during revolution of said 2nd hinge.

[0030][Embodiment 5] A hinge device given in the embodiment 3 to which said 1st hinge shaft and said 2nd hinge shaft are characterized by being mutually separated so that said 1st structure can circle over 360-degree rotation to said 2nd structure on parenchyma.

[0031][Embodiment 6] A hinge device given in the embodiment 1 providing said restraining force in which said stop regulates revolution of said 1st hinge according to the range of the 1st movement including the stop engaged in operation by said 1st structure.

[0032][Embodiment 7] A hinge device given in the embodiment 1, wherein said 2nd torque is said twice [ about ] 1st torque.

[0033][Embodiment 8] A hinge device given in the embodiment 1 characterized by bringing about the half-open angle to said 2nd structure of said 1st structure according to the difference of said 1st torque of the 1st movement within the limits, and said 2nd torque of the 2nd movement within the limits.

[0034][Embodiment 9] It has the cam type locking tab constituted so that said pintle might engage with the notch to which said socket corresponds by friction, release was possible and said 2nd hinge might lock said pintle to said socket including a pintle and a socket, A hinge device given in the embodiment 1 being able to circle so that said cam type locking tab may separate from said notch, if said pintle adds said 2nd torque.

[0035][Embodiment 10] A hinge device given in the embodiment 9 which the 2nd hinge can circle under the 3rd torque if said cam type locking tab separates from said notch, and is characterized by said 3rd torque being smaller than the 1st said torque and said 2nd torque, and being smaller than said restraining force.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]The partial fracture figure of the hand held computer notebook in which the hinge device constituted according to the desirable embodiment of this invention is shown.

[Drawing 2]The side view of the hand held computer notebook shown in drawing 1 showing the revolution covering 360-degree rotation on the parenchyma over the bottom panels of a cover panel.

[Drawing 3]The figure showing the 1st hinge that combines with a linkage element and operates, the 2nd hinge, the included hinge device of a desirable embodiment, and each hinge.

[Drawing 4]The enlarged drawing of the computer notebook of drawing 1 in which the hinge device of the desirable embodiment was shown in detail.

[Description of Notations]

A: The 1st hinge shaft

B: The 2nd hinge shaft

10: Hand held computer notebook

12: Bottom panels

- 12a: Keyboard
- 12b: Cavity
- 14: Cover panel
- 14a: Display screen
- 16: Stylus
- 18: Hinge device
- 20: Linkage element
- 20a: The piece of a back part
- 20b: The piece of the front part
- 22a: Upper part socket part
- 22b: Upper part socket part
- 23: Slot
- 24a: Bottom socket part
- 24b: Bottom socket part
- 25a: Side attachment wall
- 25b: Side attachment wall
- 26a: Floor
- 26b: Floor
- 27a: Side attachment wall
- 27b: Side attachment wall
- 28a: Annular rib (part)
- 30: The 1st hinge
- 32: Shaft
- 32a: Tab
- 34: Housing
- 34a: Tab
- 40: The 2nd hinge
- 42: Pintle
- 42b: Tab
- 43: Head
- 44: Helical spring
- 44a: Washer
- 44b: Washer
- 46a: Cam type locking tab
- 46b: Locking tab
- 47a: Side attachment wall

**47b: Side attachment wall**

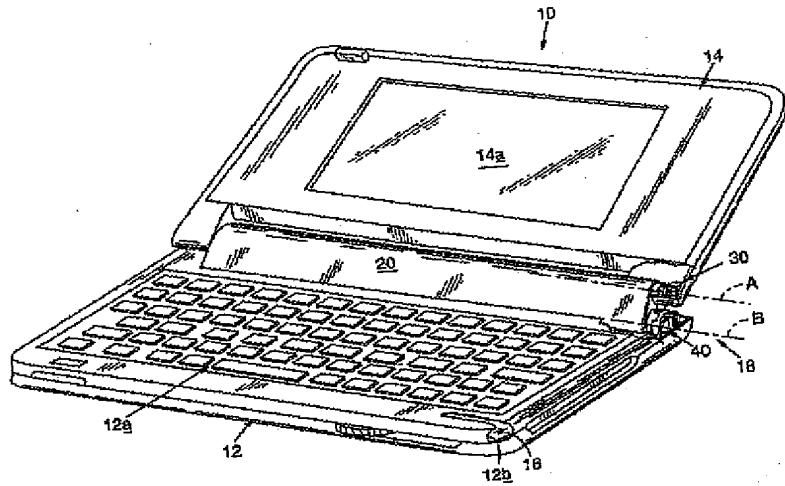
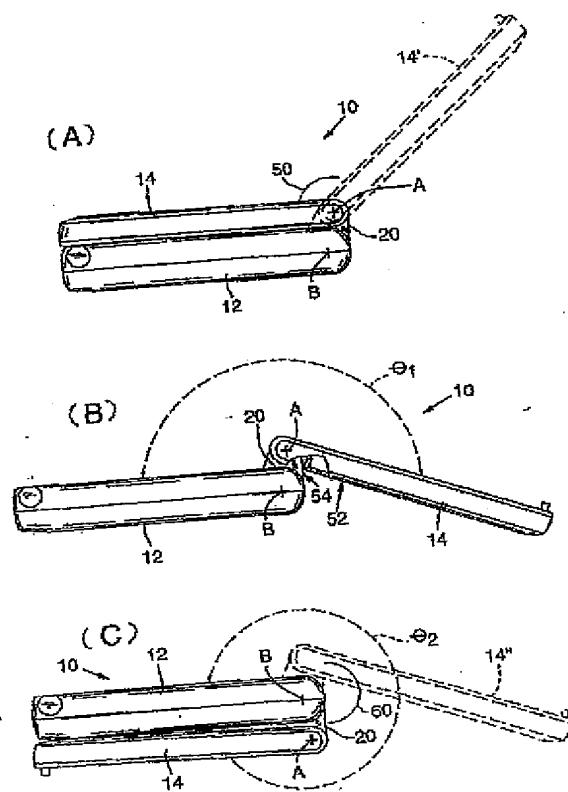
**52: Cover panel outside surface**

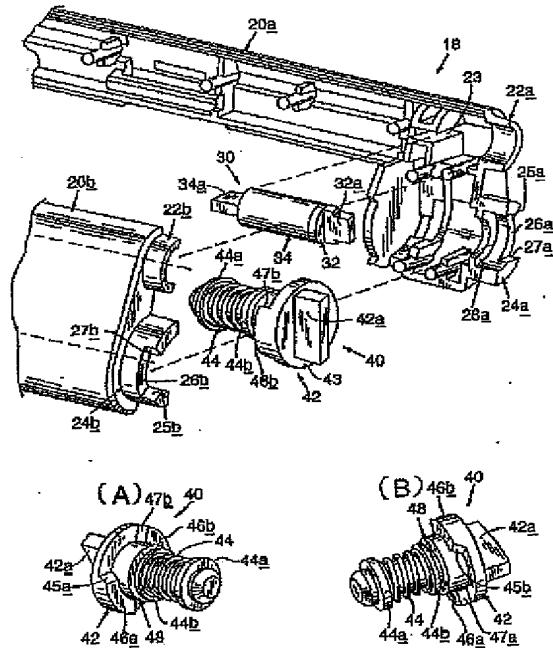
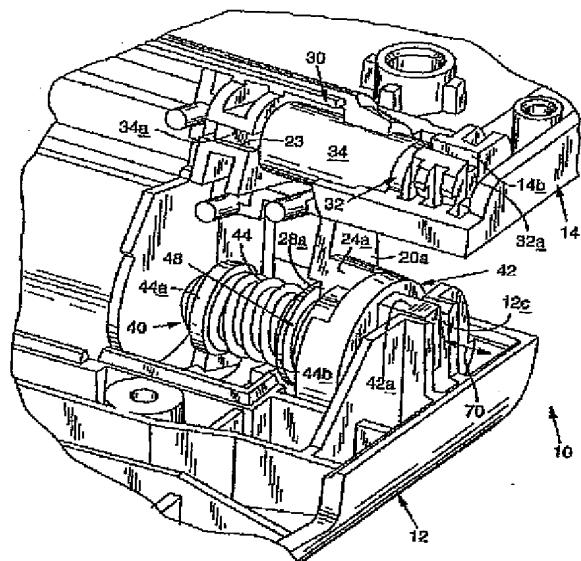
**54: Linkage element outside surface**

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**DRAWINGS**


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[Drawing 1]

[Drawing 2]


[Drawing 3][Drawing 4]


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